

## Research Article

# Effects of Core Stabilization Exercises on Low Back Pain, Disability and Back Muscle Endurance in Patients with Lumbar Disc Herniation

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### Abstract |

**Background:** Lumbar disc herniation is a common musculoskeletal disorder leading to spinal degeneration. Core stability influences lumbar biomechanics, which improves muscle endurance through decreased pain of the lower back leading to minimal chances of disability.

**Objective:** To determine the effects of Core stabilizing exercises on low back pain, disability and endurance of back muscles in Lumbar Disc Herniation patients.

**Methods:** Randomized controlled trial was conducted on 52 patients. It was conducted 3 times a week for 30 minutes for 6 months. Participants allocated into two equal groups by lottery method. Group A was treated with controlled conventional treatment and core stabilizing exercises. Group B received only conventional treatment. This information was collected using NPRS and ODI. Besides this Biering-Sorenson and trunk flexion endurance tests were used. Probability sampling was used. Settings included AMTH, PSRD and NHMC. The study was conducted for 6 months. Ethical permission by ethical review board. Data analysis by SPSS. This included male and female patients, age 20 to 60 years with disc herniation. Participants with recent surgery, inflammatory arthritis, cauda equina syndrome and spinal tumor were excluded.

**Results:** After 8-weeks of core stabilization exercises, values of Group A are 1.93 for pain, 16.08 for disability, 1.27 and 40.54 for endurance whereas Group B showed values of 4.74 for pain, 34.08 for disability, 2.15 and 34.81 for endurance. Independent t-test showed significant difference between 2 groups with p value < 0.05. Results of current study showed considerable reduction in low back pain and disability, and a significant increase in back muscles endurance in the treatment group.

**Conclusion:** Core stabilization exercises were effective in improving function, reducing pain, reducing functional disability and enhancing endurance in patients of lumbar disc herniation and lower back pain.

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### Introduction

Disc herniation pain is defined as radiating back pain from lumbar region to the dermatomal nerve root along the sciatic or femoral nerve trunk and is the commonest disorder of musculoskeletal in individual.<sup>1</sup>

A vast majority accounting for about 90% faces the low backache which is the most frequent type of low back pain.<sup>2</sup> Another research project stated that prevalence of life time disc herniation is estimated around 10%.<sup>3</sup> While anatomical evidences stated that about 20% -

40% disc herniation is present asymptotically with an imaging test.<sup>4</sup> 2-5% of patients presented for a medical treatment thought to be disc herniation while 40% of patients seeking for help suffered from disc herniation.<sup>5</sup>

With aging, the incidence of the degeneration process of disc gradually increases due to loss of osmotic pressure in the nucleus.<sup>6</sup> The underlying mechanism as evident from numerous studies connotes that the cell plates undergo thinning which forms fissure and sclerosis of the subchondral bone occurs leading to cell necrosis.<sup>7</sup> Some risk factors of disc degeneration are genetic or inherited like poliomyelitis that is the leading causes of disc degeneration. Other factors include age along with some environmental factors like loading history that leads to degeneration of the disk.<sup>7</sup> Some of the physical risk factors are obesity, smoking, poor general health status and psychological distress.<sup>8,9</sup> Other causes of disc herniation are lifting heavy weight, prolonged incorrect posture, and decreased flexibility as well as any trauma or injury can cause the disc herniation disease.<sup>2</sup>

The studies conducted to assess the efficacy of different treatment options viable to treat low back pain inculcated that oxygen therapy was more effective treatment.<sup>10</sup> One of the studies stated that Conservative treatments like core stabilization exercises for lumbar spine are useful to relieve pain and improve performance.<sup>11</sup>

Sorensen Biering and Trunk Flexion Test are used to assess the endurance in patients with low back pain. Basically, Sorensen Biering Test gives distinguished measures in terms of position holding duration. It is used to differentiate between participants with and without low back pain. The reliability of Biering Sorensen Test is 72.8%.<sup>12</sup> Large number of studies were conducted to show the effect of core stability exercises on pain and disability but there is insufficient data available on the effectiveness of core stability exercises on patients with disc herniation presenting with low back ache. These maneuvers will help to decrease low back pain and disability in the patients with lumbar disc herniation. Additionally, there is need to clarify the impact of core stability on global as well as segmental muscle stabilizers. There is no literature available regarding the effectiveness period of the stabilization exercises. Hence, my study targeted to assess the effectiveness of core stabilization exercises on Low Back pain in patients with disc herniation along with the estimation of effec-

tiveness duration of the aforementioned exercises.

## Methods:

This was a randomized controlled trial. Sampling technique used in this study was probability sampling. Two groups were allocated for the participants through randomization using the lottery method. Participants were recruited following the recommendation of consultant physiotherapist at Arif memorial teaching hospital, Pakistan society for the rehabilitation of disabled (PSRD) and National hospital and medical centre. The study was conducted in a time frame of 6 months. Calculated Sample size was 52 that was measured using G- Power 3.1.92 software by assuming 5% degree of freedom and 5% attrition rate with 0.80 power. The allocation ratio  $N2/N1 = 1$  which calculated total sample size of 52 including both group A and B 26. The included participants were male and female patients with age 20 to 60 years already diagnosed with disc herniation by radiologist through MRI. All participants with recent surgery, inflammatory arthritis, cauda equina syndrome and spinal tumor were excluded. Bi-lingual Informed consent was signed by each patient participating in the study. After group allocation on the patients' first visit, a detailed history and physical examination was conducted. Baseline measurements were taken for all the patients matching the inclusion criteria. Demographic data for each participant was acquired through a self-developed questionnaire. The study participants were kept blind about groups and treatment protocol. Two groups A and B were given interventions based on outpatient rehabilitation program. The participants of group A were given Conventional Treatment along with Core stabilization exercises where as participants of group B was given only conventional therapy (shown in Figure 1).

The intensity of pain was measured by a numerical pain rating scale (NPRS), which is an accurate and reliable tool for measuring pain intensity.<sup>13</sup>

Disability in functional activities was assessed by an accurate and reliable questionnaire, i.e., Oswestry disability index (ODI), which has been in clinicians' use since 1980s.<sup>14</sup>

Modified Biering-Sorensen test was used to measure muscle endurance of spine. Patient position was prone with his pelvis at the edge of the couch, cross position

of the hands over his chest and horizontal position of the upper trunk outside the edge of the table. Therapist commanded the participant to maintain the aforementioned position. Duration was recorded as the participant maintained the position. This duration was noted as point of spine extensor muscles endurance.

Trunk flexion test was incorporated to assess the endurance of abdominals. The patient was in a sitting position with knees and hip in 90° flexion and hands on shoulders with arms crossed in front of chest. To maintain this position assistant had grabbed the legs. When the patient lost endurance his time was noted.

Group A was treated with conventional treatment which included baseline treatment by using hotpack and then by using modality (therapeutic ultrasound) and core stabilizing exercises. The core stabilization included stretching exercises: Prone position Quadriceps stretching, hip flexors, Adductors and Hamstring Stretching in standing position for low back muscles and abdominal muscles. Additionally it included strengthening exercises: Abdomen pull in (tummy tucks) in supine position, Abdomens pull in (tummy tucks) with knee flexion into the chest in supine position, Abdomen pull in (tummy tucks) by heel sliding on the couch in supine position, prone cobra position, Supine superman position and Planks. Treatment was given 3 times a week for the duration of 30 minutes including electrotherapy treatment. The final outcome was noted following a follow up that was conducted after the 8 weeks-treatment.

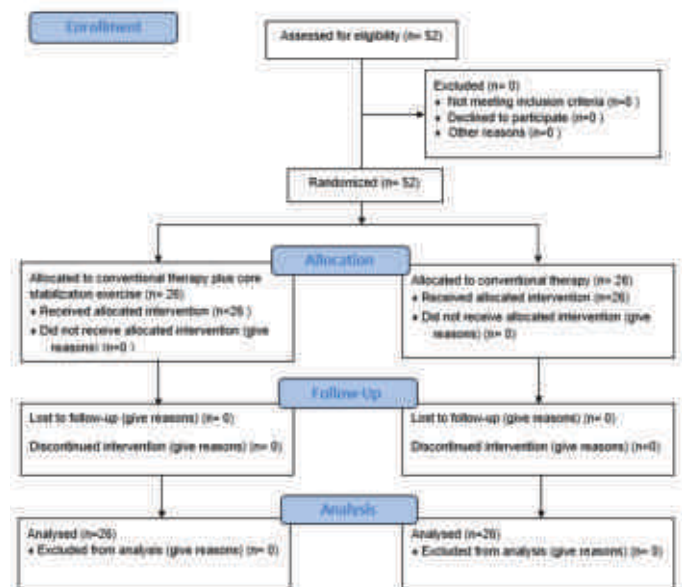
Group B received only treatment for the eight weeks. Treatment included ultrasound therapy in continuous mode, frequency of 1 MHz and intensity of 1.0 W/cm<sup>2</sup> for 5 minutes, diclofenicvoltral gel was used. Moist heat pack, in combination with TENS, was applied for 10 minutes. The wet heat pack was pre-immersed in a hydro collator having a set temperature of 60°C and then wrapped in 6 layers of the towel before application to the patient. The number of towel layers was increased or decreased according to the patient's tolerance level. Comfy Combo TENS was used with following parameters; Mode = Burst, Numbers = 5HZ, Pulse Width = 150us, Output Intensity = 20-40mA (as tolerated by the patient)

After having collected the data was analysed using SPSS for Windows software version 21. All qualitative variables were shown in frequency tables and percentages.

The normality of the data was assessed by Kolomogrov-Smrinov Test. Parametric test (Independent-T test); parametric test are based on assumption about distribution of population. Test of mean comparison was selected to apply for measuring difference of the two groups.

## Results:

Comparison of both study groups baseline measurements for numeric pain rating scale score, Oswestry Disability Index, Biering Sorensen Test and Trunk Flexion Endurance Test are illustrated in Table 1, which shows that both groups were comparable. Out of the 52 participants included in study, the minimum age was 20 years and maximum age was 60 years where the mean age of Core Stabilization Exercises Group was 35.53±6.68 years and 36.00±6.94 years. Comparing the pre and post treatment pain, it was evaluated using Independent T Test that there is significant difference between 2 groups with p value < 0.05 as shown in Figure 2. There is improvement in pain as evident by the independent T test with mean value of 1.93 in core stabilization exercise group which was clinically more significant as compared to 4.74 in conventional group, Biering-Sorenson test showed significant difference in endurance between 2 groups with p value < 0.05. In Figure 3, the endurance with mean value of 1.26 in core stabilization exercise group was clinically more significant to 2.15 in conventional group. The increase in mean of endurance in core stabilization exercise group was 40.54 compared

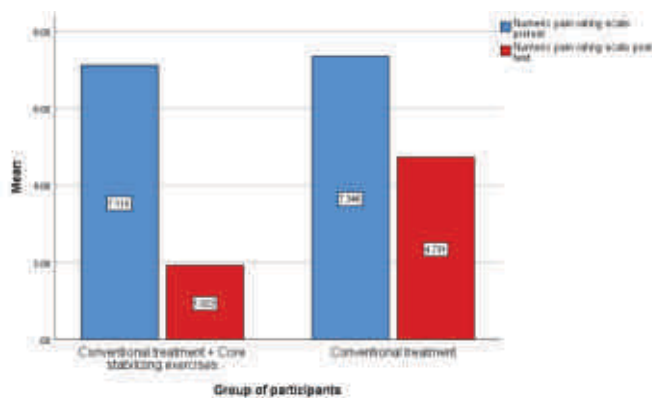


**Figure 1:** Flow chart of study

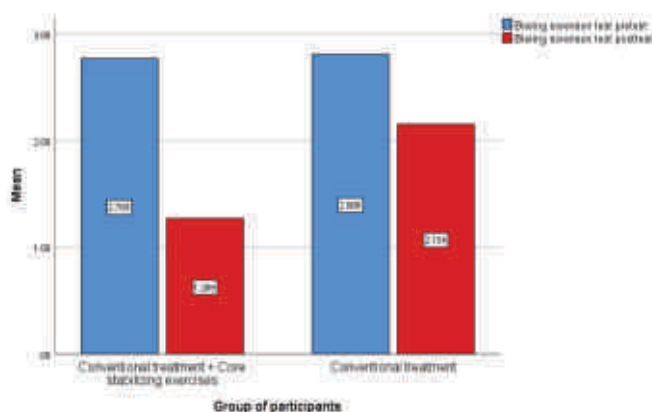
to 17.51 in conventional treatment group which was clinically more significant in core stabilization group as shown in Figure 4.

**Table 1:** Base line measurement for numeric pain rating scale score, Oswestry Disability Index, Biering Sorensen Test and Trunk Flexion Endurance Test.

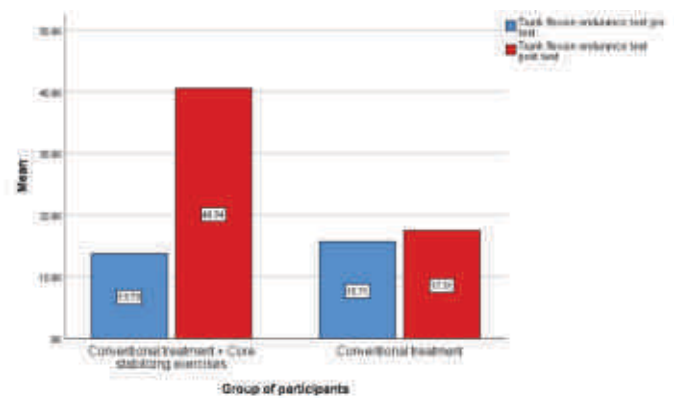
	Conventional treatment + Core Stabilization Exercises (n=26)	Conventional Treatment (n=26)	P-value
	Mean $\pm$ SD	Mean $\pm$ SD	
Age of Participants	35.43 years	36.00 years	0.760
Numeric Pain Rating Scale	7.12 $\pm$ 1.15	7.35 $\pm$ 1.13	0.467
Oswestry Disability Index	53.54 $\pm$ 10.96	52.62 $\pm$ 15.14	0.802
Biering Sorensen Test	2.77 $\pm$ 0.43 minutes	2.81 $\pm$ 0.41 minutes	0.740
Trunk Flexion Endurance Test	13.74 $\pm$ 4.75 seconds	15.72 $\pm$ 5.83 seconds	0.185



**Figure 2:** Bar Chart of NPRS Score



**Figure 3:** Bar Chart of Biering Sorensen test



**Figure 4:** Bar Chart of Trunk flexion endurance test

## Discussion

In the present study the effects of core stabilization exercises were seen on patients with lumbar disc herniation having Low Backache. For this purpose participants were grouped into experimental and control. Control Group received only conventional treatment whereas Conventional treatment plus Core Exercises was given to the experimental group. Trunk flexion Test and Biering Sorensen Test were used to evaluate the outcomes. During the current course of the study, efficacy of core stabilization exercises was checked in lumbar disc herniation patient with low back pain.

Oswestry Disability Pain index ODI was used to check level of functional disability. This questionnaire included total 10 sections, each section having 5 further statements regarding daily routine activities; lifting, washing, walking etc. The total possible score is 5 for each section. If the first statement is marked the score will be zero, while marking the last statement of a section then the score will be 5. When all the sections were completed then the score would be calculated.<sup>15</sup> To check endurance Trunk Flexion endurance tests and Biering Sorensen Test were used. These tests are used to check the isometric resistance of hip and back extensor muscles. This test has different hold-time durations for healthy, prior to low backache and current low backache participants. Maximum time to hold this position is 4 minute. VAS and Oswestry Disability index were taken to assess the intensity of pain and to check Functional disability level in lumbar disc herniation patients with low back pain.

Chaoqun et al conducted a study on young patients suffering from Lumbar disc Herniation. To check the level of pain and Functional disability, he compared



core stabilization exercises with General exercises. Visual Analogue Scale was scale of choice to assess intensity of pain and Oswestry Disability index was valid to assess functional limitation. He concluded that core stabilization exercises are efficacious to lessen pain as compared to general exercises.<sup>11</sup>

The results of this study were persistent with the findings of the earlier studies that analysed the positive impact of core stabilization exercises on disc herniation with low back pain.

Daekaun conducted a study to check the effectiveness of lumbar stabilization exercises in lumbar disc herniation patients. In his study, he divided the participants into two groups; Balance centre resistant stabilization exercise group, three dimensional stabilization exercises group. The impact of the intervention was recorded through disc herniation index. He reached the conclusion that lumbar stabilization exercises have significant effects on lumbar disc herniation.<sup>16</sup> Results of the current study were similar to the results of DaeKaun's study that lumbar stabilization exercises have tendency to lessen low back pain but this study also decrease in disability in lumbar disc herniation patients.

There are some limitations of this study. First, due to small sample size, the findings may not be generalized. Secondly, therapists were not blinded to the therapy options; however outcomes were measured by a researcher unaware of the treatment group allocation.

## Conclusion

Core stabilization exercises were effective in improving function, reducing pain, reducing functional disability and enhancing endurance in patients of lumbar disc herniation and lower back pain.

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